Mini PCIe Socket Interface+ User Manual

Gesytec GmbH
Pascalstr. 6
52076 Aachen, Germany

Tel. + (49) 24 08 / 9 44-0
Fax + (49) 24 08 / 94 4-100
email: info@gesytec.de
www.gesytec.com

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Gesytec

This manual …

… provides you with all the information which you will require to use the Easylon® Mini PCIe Socket Interface+.

However, this manual will neither explain aspects of Echelon's® LONWORKS® technology, nor details of the ISO/IEC 14908 standard on which this product is based, nor Echelon's Microprocessor Interface Program (MIP). The drivers of the Mini PCIe Socket Interface+ have been developed in compliance with the driver specifications of the Echelon Corporation. Details of these are as well not described in this documentation. For further information on the LONWORKS technology please refer to the extensive documentation provided by Echelon.

After a general presentation of the Easylon Mini PCIe Socket Interface+ in Chapter 1, Chapter 2 describes the necessary steps to install the module.

Chapter 3 gives the technical specifications of the device.

Chapter 4 provides some information on the usage of the Interface+ as virtual network node (MIP).

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1 Product Information

This manual describes the Easylon Mini PCIe Socket Interface+

Figure 1-1 Easylon Mini PCIe Socket Interface+[1] FT-X2 and EIA-485

1.1 Variants

The following variants of the Easylon Mini PCIe Socket Interface+ are described in this documentation.

Order Code	Type Code	Network Interface Type	Remark
P.V20A03	LVD.DBA	EIA-485	extended temperature
P.V20A06	LVD.FBA.	FTX	extended temperature

Table 1-1 Variants and order-codes

1.2 Scope of Delivery

- Easylon Mini PCIe Socket Interface+ module
- Technical short information
- Installation and documentation CD with
  - 32/64 bit driver for Windows[2] XP / Vista / 7 / 8 / Server 2003 / 2008 / 2008R2 / 2012
  - Easylon RNI Software for remote LONWORKS access
  - EasyCheck diagnosis utility for Easylon interfaces
  - Documentation in Adobe Acrobat .PDF format
  - Sample design for a carrier board (Gerber and Step files)

1 Modification of connectors on request

2 A Linux driver is available in source code on demand

1.3 Overview

The Easylon Mini PCIe Socket Interface realizes an IEC14908 compliant interface in the design of a PCIe ”Full-Mini Card with bottom side keep outs (F2)“. It can be used in devices offering a Mini PCIe socket of the following type:

- Full-Mini-Only Socket (connector A)
- Dual-Use Socket (connector A)
- Dual Head-to-Head-Socket (connector A)

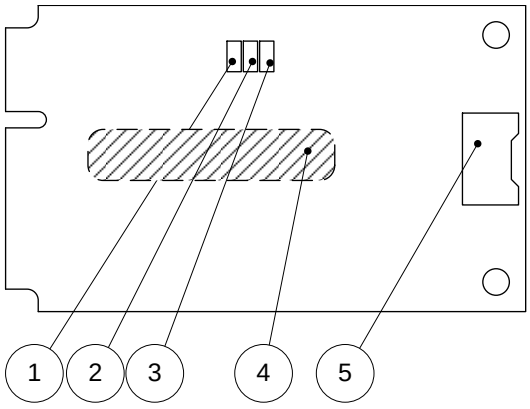
The module, which can be integrated as a plug-in module into OEM devices, is a network interface link between a PC and a control network according to the abovementioned standard respectively the LONWORKS specifications. It uses the USB interface of the Mini PCIe slot and thus implements a LON USB interface.

As an Easylon Interface+ the network interface provides up to eight logical driver interfaces thus realizing the parallel access of several applications to the network either in MIP or LNS compatible mode.

Concerning the LON connection the module is available in different transceiver variants. Additionally to the FT-X2 transceiver for free topology networks there is an EIA-485 variant. Service and traffic LED signals are available via the socket connector; a service button has to be connected externally. Status, error and service LEDs are on board. The LON interface is galvanically separated from the Mini PCI Express ground. The module has been designed for an extended temperature range of -40 to +85 °C.

The Easylon Mini PCIe Socket Interface is a so called high speed USB device according to USB standard 2.0, however compatible with USB 1.1.

As an OEM module a certain flexibility with respect to customer specific requirements is observed, e.g. with respect to the connector types or positions. The respective module may therefore be different from the description in this documentation.



(1) Traffic LED (yellow)
(2) Status LED (green)
(3) Error LED (red)
(4) Type sticker on rear side
(5) LonWorks connector

Figure 1-2 Module components

1.3.1 VNI (Virtual Network Interface)

With VNI Echelon defined a transparent mode of operation for LonWorks interfaces. In this mode LonTalk packets are not preprocessed on the interface device, but the PC realized the complete network access. Thus the applications running on the PC receives and sends the messages. VNI interfaces overcome several limitations of the conventional interfaces using MIP or NSI firmware. For instance they offer an increased performance. Easylon Interfaces+ are compatible with the Echelon VNI interfaces and can be used with LNS based software such as LonMaker for Windows without problems.

1.3.2 MIP

The Neuron Chip used on the conventional network interface requires a firmware to realize the interface functionality. The de facto standard was the MIP firmware. Many applications still use the functionality of this firmware, which realizes layers 3–5 of the LonTalk protocol, namely network, transport and session. Using the drivers of the Easylon VNI Interfaces (Interface+) up to 8 logical MIP interfaces can be used with one interface card, i.e. an Easylon VNI Interface replaces 8 standard MIP interface cards.

2 Installation

Please check the delivered items. You must find the Easylon Mini PCIe Socket Interface+ and an installation CD, containing drivers and this documentation.

2.1 Hardware Installation

Please refer also to the manual describing the device into which you want to insert the Easylon Mini PCIe Socket Interface+. Turn off power, open the device and fix the module into a suitable Mini PCIe socket. Please observer chapter 3.4, "Connector Pin Assignment". Restart the PC after the module has been installed and insert the Drivers & Documentation CD in order to get the appropriate driver.

2.2 Driver Installation

Drivers for different operating systems are available for the Easylon Mini PCIe Socket Interface+. Currently these are Windows XP, Vista, 7 and 8 and the Windows Server OS 2003, 2008, 2008 R2 and 2012. The drivers support both, the 32 and the 64 bit version of these operating systems. Latest driver versions you can download via the Easylon Support pages of our web site: www.gesytec.com.
A Linux driver is available in source code on request.

Installation for different operating systems is described in the following sections.

Windows operating systems section 2.2.1

16-Bit driver under 32-bit Windows section 2.2.2

This section also describes in short the diagnosis utility „EasyCheck", which can be installed separately from CD.

2.2.1 Driver for Windows Operating System (WDM Drivers)

This section describes installation and setup of the Easylon Interface card drivers for the Windows operating system from XP onwards.

The setup program is using the same WDM driver (Windows Driver Model) for all operating systems.

Note: For installation you can either use the Windows assistant or the program FastUpd.exe for manual installation, which is much more straightforward (cf. chapter 2.2.1.2).

The latter is especially helpful if you are running Windows 7 and later or have to install several instances of the driver.

2.2.1.1 Installation using the Windows Assistant

After the Easylon Interface+ has been mounted Windows will recognize the new device and start the hardware assistant.

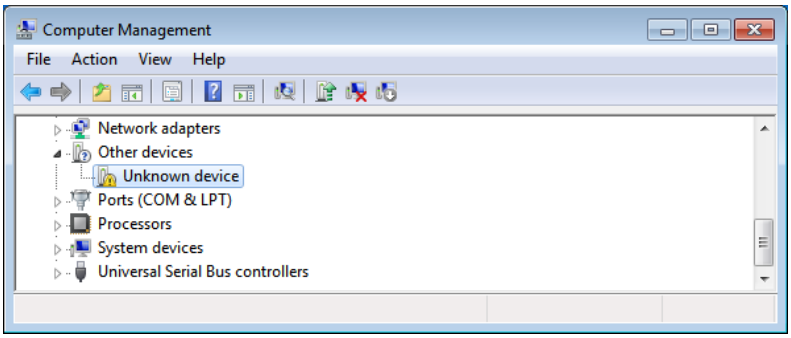
If Windows should not find the driver on the “Drivers and Documentation” CD or the driver should be elsewhere, please select the appropriate drive and select the setup file “LvxLvu.inf” and the driver “Gesytec Lvuwdm Driver” from the “LvxLvu “ directory.

Windows 7

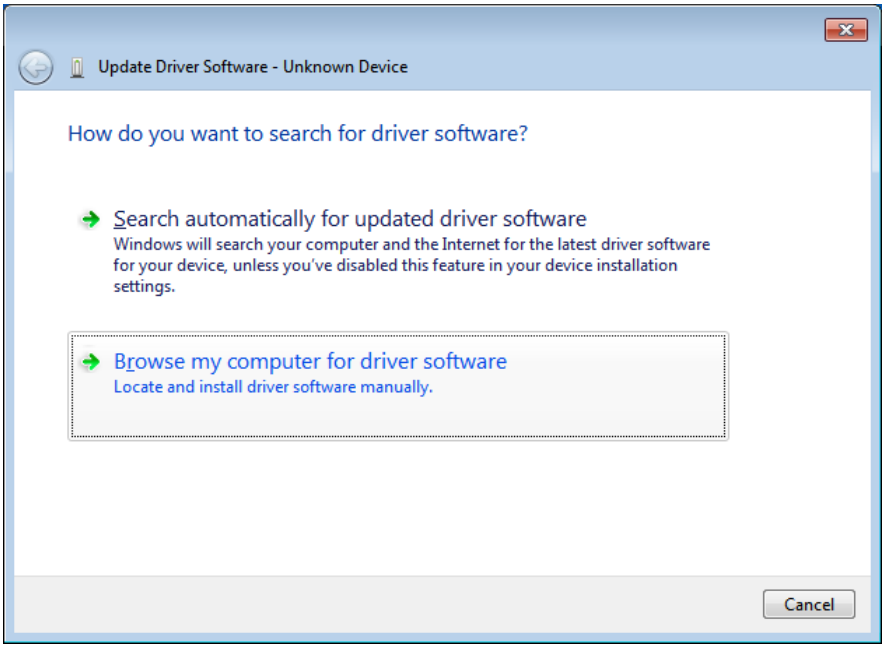
Windows 7 systems connected to the Internet directly start looking for a driver at Windows Update and therefore ignore the CD. Consequently the installation using the assistant will fail and manual settings are required.

You can either follow the steps described in 2.2.1.2 “Manual Installation and Update” or proceed as follows:

Open the Device Manager (e.g. via the control panel).



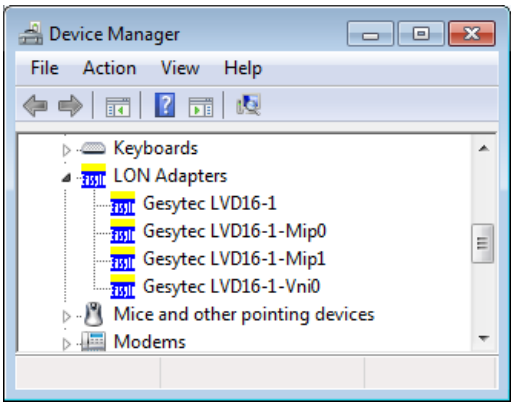
Right click on the entry for the unknown device and select “Update Drivers”.



Select „Browse my computer ….“ and indicate the drive with the “Drivers & Documentation” CD. Finally give permission for the Gesytec driver setup.

Final Steps

After successful completion of the installation the device manager will show the interface under „LON Adapters“.



Here you will find a „Gesytec LVDx-y...“ entry, with x designating the number of the USB host controller and y the port. If hubs have been cascaded the respective port numbers are given as well.

If, after the installation the green LED does not blink an error has occurred in the Easylon Mini PCIe Socket Interface+ installation. In that case, please restart the PC.

The device is now ready to access the LONWORKS network.

2.2.1.2 Manual Installation and Update

The easiest way to install the driver is to ignore the hardware assistant and run

FastUpd.exe

from the "Driver/LvxLvu" folder of the CD-ROM.

If the "Drivers & Documentation" CD interface has opened in your browser you may access the driver setup as well via "Products" "Easylon Mini PCIe Socket Interface+" and selecting the button for the operating system.

The same program you will use to update an existing driver.

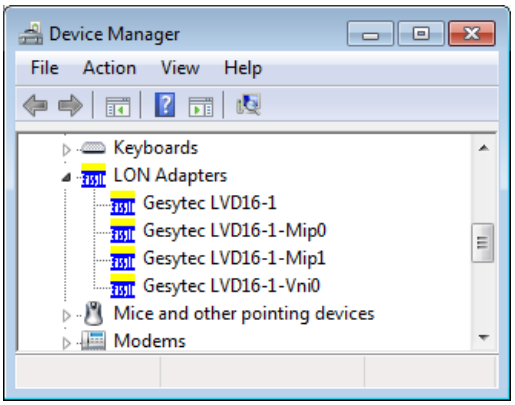
2.2.1.3 Driver Instances

The driver consists of a basic part for the interface hardware "LVDx-y"[3] and of up to eight logical VNI drivers „LVDx-y-Vniz" and up to eight logical MIP drivers„LVDx-y-Mipz". These driver instances can be used like independent network interfaces.

For each logical driver instance an individual node-id (unique identification corresponding to the Neuron-ID) is used. VNI and MIP drivers with the last digit *z* will be assigned the same node-id. There is a maximum of 8 node-id available for each interface device.

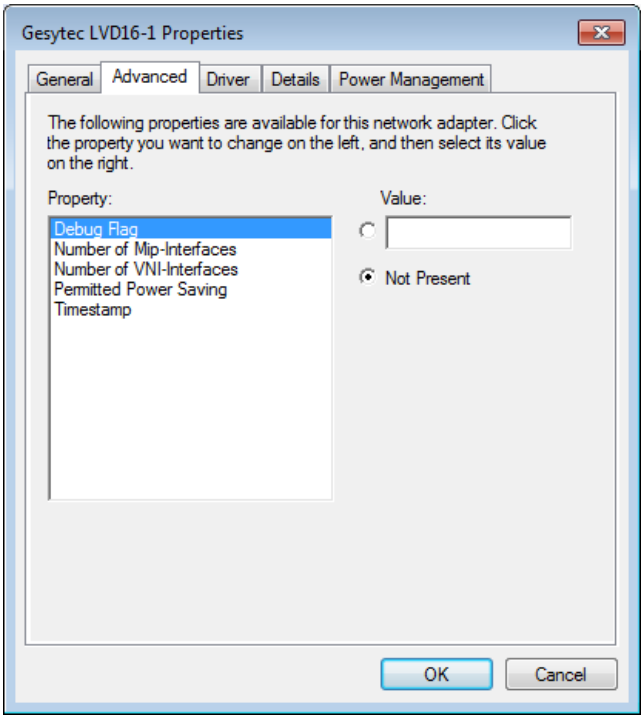
2.2.1.4 Settings

There are further settings available for the Easylon Mini PCIe Socket Interface+ which may be helpful in certain operating conditions. They can be found in the "LON Adapters" section of the device manager. Select the properties of the desired device.



The „Advanced Properties" offer the following settings:

[3] x is designating the number of the USB host controller and y the port. If hubs have been cascaded the respective port numbers are given as well.



Debug Flag

The value comprises a DWORD in hexadecimal notation of different flags for debug purposes. Usually it is set to 0 (not existing). Setting the single bits will turn on special debug features. In the current driver versions bits 1 and 3 are used.

Bit 1: LON telegrams at the interface from and to the USB bus are shown in debug output.

Bit 3: CREATE and CLOSE) of the driver are displayed in the debug output.

Note The debug output for instance can be displayed using the DebugView program, which is freely available at www.sysinternals.com.

Number of Mip-Interfaces

The number of virtual MIP-Interfaces can be set here (0 – 8, default = 2).

Number of VNI-Interfaces

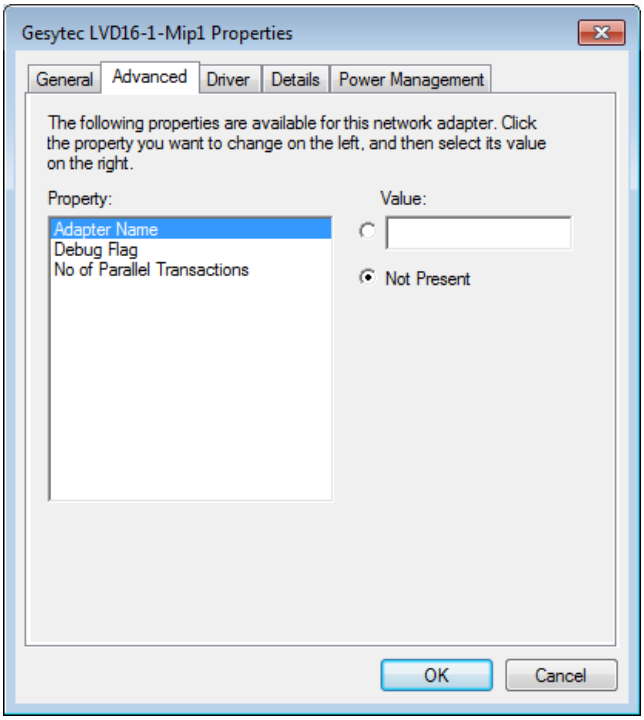
The number of virtual VNI-Interfaces (Interfaces+) can be set here (0 – 8, default = 1).

ATTENTION There are 8 node-IDs available for each interface device. These have to be assigned appropriately to the applications using the device either as VNI or as a MIP interface. If, for example, a VNI application is using the instance LVDx-y-Vni0 with its corresponding node-id, a MIP application must not use the instance

LVDx-y-Mip0.
VNI applications (e.g. LNS) usually generate a node-id of their own, which will then be additional to the 8 standard node-id belonging to the interface device.

Permitted Power Saving
Usually the LON USB adapter allows a standby mode with applications running (Standby). At certain conditions however, (e.g. LON USB adapter using a hub under Windows 2000) the current supply to the USB adapter will be shortly interrupted during return from the standby mode by the hub. Under such conditions the standby mode must be turned off (None).

Parameters for logical instance



Adapter Name

An arbitrary name can be chosen freely (e.g. building 7).

NOTE This name must not be used by another instance. If the name is already in use, the device will not start (code 10).

Debug Flag

This field contains a DWORD in hexadecimal notation of different flags for debug purposes. Usually it is set to 0 (= not existing). By setting the single bits certain debug features can be turned on. At the moment the bits 0, 1 and 3 are used:

Bit 0: LON telegrams at the interface from and to the application are displayed in the debug output.

Bit 1: Telegrams at the interface between PC and interface hardware are displayed in the debug output.

Bit 3: CREATE and CLOSE of the driver are displayed in the debug output.

No of Parallel Transactions
By default the Easylon MIP driver will handle 16 parallel transactions. This feature can be turned off by setting the value to 1.

2.2.1.5 De installation

WDM drivers are de installed using the "Device Manager". Among "LON Adapters" select the "Gesytec LVDx-yy" driver and click "de-install".

2.2.2 Windows and 16 Bit Applications

The Windows driver for the 32 bit Windows versions also provides a 16 bit interface. (Unfortunately Microsoft does not support this in the 64 bit versions.) To use it, the following entry has to be made in the file „config.nt", usually found in the windows\system32 directory:

Device=%SystemRoot%\system32\ lpxdos.exe –Llvu1-2-Mip0

The 32 bit LON device used is specified by the optional –L or /L parameter:

/L*name*

name =

lvu1-2-Mip0 for device LVU at USB host controller 1 and with port number 2 at USB root hub

Note: Two subsequent "l" characters have to be entered, one indicating the parameter -L, the second as first character of the name: –Llxxxx

The 16 bit LON device used is specified by the following optional parameter:

/D*n*

with *n* = 1...9 for LON1 to LON9

Without this parameter, the interface will be assigned the first unused name starting with "LON1".

2.2.3 EasyCheck – Quick Interface Diagnosis

In addition to the drivers, the test utility "EasyCheck" can be installed in the respective program directory (default: : \Easylon\Lpx). The program checks inter-

face and software environment and displays information, from which can be concluded on the reasons for problems in connection with the interface.

The program “EasyCheck” runs an analysis of the system’s software. It will open the selected interface, check the driver version and display it. By sending a “query status” command the communication with the hardware is tested. Using the “read memory” command the utility will show if the device is running MIP or NSI firmware. Properly installed Easylon Interfaces will send a corresponding answer.

3 Technical Description

3.1 Network Interface

Easylon Interface+ cards are using an FPGA for accessing the control network. For which sufficient RAM is available as network buffer for transmit and receive. For use in protocol analysis each packet received is transmitted to the application with timestamp of 1 ms accuracy. The FPGA is connected to the computer bus.

Eight node-ids are available on the interface for identification within the control network (cf. “Driver Instances”). The interface status is signaled by a status LED. The Service push button is read by the driver software (Figure 1-2).

3.2 Mini PCI Express Interface

The PCIe ”Full-Mini Card with bottom side keep outs (F2)“ can be used in devices offering a Mini PCIe socket of the following type:

- Full-Mini-Only Socket (connector A)
- Dual-Use Socket (connector A)
- Dual Head-to-Head-Socket (connector A)

3.3 LED Signals

Position cf. Figure 1-2

Staus LED	Green	blinking:	in normal operation
Error LED	Red	blinking ON	firmware is loaded error, e.g. after reset
If both LEDs are off, the module is out of operation			
Traffic LED	yellow		signals network traffic

3.4 Connector Pin Assignment

3.4.1 Mini PCIe Connector

The Mini PCIe connector is used according to the standard.

Pin	Name	Mini PCIe Socket Interface	Pin	Name	Mini PCIe Socket Interface
51	Reserved	nc	52	+3.3Vaux	Supply
49	Reserved	nc	50	GND	GND
47	Reserved	nc	48	+1.5V	nc
45	Reserved	nc	46	LED_WPAN#	LED LON TX
43	GND	GND	44	LED_WLAN#	LED LON RX
41	+3.3Vaux	Supply	42	LED_WWAN#	LED Service + button
39	+3.3Vaux	Supply	40	GND	GND
37	GND	GND	38	USB_D+	USB 2.0
35	GND	GND	36	USB_D-	USB 2.0
33	PETp0	nc	34	GND	GND
31	PETn0	nc	32	SMB_DATA	nc
29	GND	GND	30	SMB_CLK	nc
27	GND	GND	28	+1.5V	nc
25	PERp0	nc	26	GND	GND
23	PERn0	nc	24	+3.3Vaux	Supply
21	GND	GND	22	PERST#	System reset input
19	Reserved (UIM_C4)	nc	20	W_DISABLE#	nc
17	Reserved (UIM_C8)	nc	18	GND	GND
		Mechanical	Key		
15	GND	GND	16	UIM_VPP	nc
13	REFCLK+	nc	14	UIM_RESET	nc
11	REFCLK-	nc	12	UIM_CLK	nc
9	GND	GND	10	UIM_DATA	nc
7	CLKREQ#	nc	8	UIM_PWR	nc
5	COEX2	nc	6	1.5V	nc
3	COEX1	nc	4	GND	GND
1	WAKE#	nc	2	3.3Vaux	Supply

Table 3-1 Pin assignment of Mini PCIe connector

External LED outputs and service button input

Outputs 42, 44, 46 are active low Open Drain and can switch a maximum of 9 mA as per standard.

Attention: The external LEDs have to be supplied by the same 3.3 V source as the module. This is very important to avoid any latch up problems Pin 42 (LED_WWAN) has got an additional internal pull up resistor against 3.3 V.

Outputs 44 and 46 signal traffic on the LON bus. Both are connected in parallel to the FPGA and show the same signals.

Pin 42 (LED_WWAN) is output for an LED and LON service button input at the same time. Der button is connected to pin 42 and GND. Closing it will release the service message. Incoming service messages are not shown.

3.4.2 LON Connector

PIN	MNEMO	Description
1	RT +	LON data +
2	GND	ground
3	RT -	LON data –

Table 3-2 Pin assignment of 3pin LON connector, FTX variant

PIN	MNEMO	Description
1	RT +	LON data +
2	GND	Connected to ground of Mini PCIe connector
3	RT -	LON data –

Table 3-3 Pin assignment of 3pin LON connector, EIA-485 variant

The LON connector is a 90° multi-pin connector, 1 row, 3pin, 1.25 mm;
Manufacturer: PanelMate Molex 0537800370
Supplier e,g. Digikey: WM7601DKR-ND

Note: A LON connection cable is not part of the delivery. For cable assembly the following parts are required:

Description	Manufacturer	Supplier e.g.
Connector casing straight, 1 row 3pin, 1.25mm	PanelMate Molex: 51146-0300	Digikey: WM5401-ND
Crimp contakt 28-30 AWG gold for 1.25mm	PanelMate Molex: 0506418141	Digikey: WM5506-ND
Crimping tool for 1.25mm connector system	Molex: 0638117900	Digikey: WM9805-ND

3.5 Technical Specifications

Mini PCIe Socket Interface

Type	Full Mini Card, accord. to PCI Express, Mini Card Electromechanical Specification, Rev 1.2
Connector	standard Mini PCI Express connector

Network Interface

Transceiver	FT-X2, electrically isolated EIA-485, not electrically isolated, 1.25 Mbps max.
Connector	3 pin connector, 1.25 mm PanelMate, Molex

Power Supply

Power supply	3,3V ± 9%, externally via Mini PCIe connector
Current Consumption	< 100 mA typically, 150 mA max.

Operating Conditions

Temperature	
Operation	-40 ºC – +85 ºC
Storage	-40 ºC – +85ºC
Humidity	90%, no condensation

Display and Operation

On board	status LED (green) error LED (red) service LED (yellow)
via Mini PCIe connector	traffic LEDs for RX and TX service push button

Dimensions

Board (standard dimensions)	30.00 x 50.95 [mm]
Heights FTX above board	8.18 mm +0,2/-0,08 mm, not compliant to standard

For easy integration a step file of the board is available.

Conformity

RoHs	2011/65/EU

4 Programming Information

4.1 LONWORKS Network Node

Being an IEC14908 compatible interface device the Easylon Interface+ card can be used as a network node in a LONWORKS network. The Interface+ can realize one or more virtual MIP interfaces. As the external interface file (.xif) required for using the device as a network node can only be created for a specific application an example .xif file is provided. This must be adapted with the XIF editor prior to usage. The file can be found on the "Drivers & Documentation" CD.

Network Interface	Transmission Rate	XIF –File
TP/FT for virtual MIP interfaces	78 kbps	lolv075f.xif

Table 4-1 Network access and .xif files

4.2 Registry Key

The driver of the Easylon Mini PCIe Socket Interface+ makes an entry in the registry database for each found device, according to Echelon's guidelines. You will find this entry at:

\\HKEY_LOCAL_MACHINE\Software\LonWorks\DeviceDrivers.

For each Easylon Mini PCIe Socket Interface+ you will find a key with the device name (Gesytec LVDx-y...) and a character value with the driver name.

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